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(54) Title: PASSENGER CHECK-IN AND MONITORING SYSTEM

(57) Abstract: Passenger check-in and monitoring system is disclosed which uses a memory device (10) in the form of an electronic radio frequency tag containing travel and passenger information which is linked to a passenger travel ticket, passenger boarding card or other personal identity item and passenger luggage including hand luggage. The monitoring system can be extended to include all airport staff by including an electronic frequency tag in their identity card. A central computerised storage device (12) containing information relating to all available travel, passenger, staff and airport information and a plurality of suitable transmitter devices (13) which allow information to be exchanged between the data storage device (12) and the electronic tag therefore to allow all airport user and luggage movements to be monitored and, if not in accordance with expected movements or other defined parameters, an alarm to be raised.

PASSENGER CHECK-IN AND MONITORING SYSTEM

This invention relates to a passenger check-in and monitoring system for use at any location from which passengers can depart on their travels. It is thought that the invention will have particular application at Airports but it is not to be construed as being limited to this application.

Usually when travelling, a passenger will purchase a travel ticket prior to arrival at the departure location, for example an Airport, or alternatively may purchase a ticket from sales staff at the chosen departure location. In most circumstances, it is usual when the ticket is purchased, for the passenger details and travel details to be retained in a central database which is accessible by both the Airline with whom the passenger is travelling and the Airport authorities. The database is also accessible by both Airline sales staff and travel agents for booking purposes. Thus when a passenger enters an Airport to travel, a check-in process must be completed wherein the details held on the ticket, and the passengers identity, are checked against the details held in the database and, if they are correct and match, a boarding card is issued to the passenger to enable them to board the desired flight.

However, problems arise with such conventional check-in procedures insofar as the manual processing of check-in by Airport staff is time consuming and therefore it is not unusual for significant queues to form at check-in positions which has a deleterious effect on passengers.

A further problem which arises with conventional cheek-in systems is that, after having left the check-in position, it is not possible to know at any one time where each individual passenger is located. For effective security it can be advantageous to be able to monitor the whereabouts of passengers within the Airport buildings.

It is accordingly the object of the present invention to provide a passenger check-in and monitoring system in which the need for time consuming manual processing at check-in can be obviated or at least

The memory device 10 comprises an electronic tag, preferably a Radio frequency tag, which may be provided as an integral part of the passenger travel ticket or may be formed as a separate part attached or linked thereto. Data is stored digitally in the tag and is interrogated by radio frequency signals from the antenna 13.

The data storage device 12 comprises a microprocessor based system or computer system upon which data relating to all available flights and details of passengers booked to travel on those flights is stored.

The antennas 13 comprise conventional radio frequency antennas and are designed to facilitate the transmission of data from the tag 10 to the data storage system 12 and vice versa. The antennas 13 are provided at specific locations around the Airport building in a manner which will be described hereinafter.

In use as shown in Figure 1, a passenger 14 who wishes to purchase a ticket to, for example fly to a particular desired location will approach a member 16 of the Airline staff at the Airport or a travel agent in a travel agents premises. The person 16 from whom the passenger is buying the tickets will enter the flight details and data regarding the identity of the passenger into an input device 17 for example, in the form of a computer terminal. The computer terminal 17 is linked to the central data storage system 12 which contains all flight details and passenger details for all flights. Once the usual checks have taken place, the passenger 14 is issued with a ticket 11 which has integrally formed therein an electronic tag 10. The flight and passenger details are transmitted by the central data storage system 12 using the antenna 13 to the tag 10 on the ticket 11. The ticket 11 issued to the passenger 14 will, in these circumstances, hold information regarding the passenger's travel plans and also the passenger's identity. The information is transmitted from the data storage device 12 via the antennas 13 to the tag 10 on the passenger ticket in digital form, preferably at radio frequencies.

system 23 may form a virtual queue which allocates each passenger to a position in the queue based upon their priority.

Once the passenger 14 has passed to the check-in position, the passenger will be checked in accordance with normal Airport and Airline procedures and will then be issued with a boarding card which will also contain an electronic tag upon which flight and passenger information is stored. Having checked in for the flight successfully, the passenger will then exit via route "C" to the departure and gate area and once again passes through antennas 13 which read the tag on the boarding card and update the central data storage 12 as to the fact that the passenger has passed from the check-in area into the departure lounge.

An advantage of the system as described above is that as the passenger and flight details on the ticket 11 are scanned and updated upon entry into the check-in area, upon passage from the check-in area to the check-in desk and from the check-in desk into the departure lounge, if a person who is not authorised to be in any particular area is detected in that area then appropriate action can be taken. As for example if a passenger either deliberately or inadvertently attempts to enter the check-in lounge 21 and pass to the departure lounge without checking in, this would be detected by the antennas 13 placed at route exit "C" which would detect the fact that the passenger has not been checked in at the checking desk since the update provided to the tag and check-in would not be present on that passenger's card. Furthermore, once a passenger has been checked in, the check-in system 23 will automatically update the central data storage 12 and this will automatically cause the next passenger listed in the virtual queue to be advised via the display 24 at the seating area 22 that a check-in desk is available for checking in.

Obviously, it will be appreciated that with the system as described above, a passenger's route through the check-in desk to the departure lounge can be monitored very easily and conveniently and furthermore the position of the passenger in the check-in area can be monitored precisely.

Further, it is also possible to arrange for display on display 24 the identities of all passengers where tags have been detected by the antennas and passengers can be suitably instructed, upon entry into the check-in area, to check the display 24 to ascertain whether their tag 10 has been detected and, if not, to alert airport staff to the fact.

Still further, it is of course possible to attach similar tags 10 to luggage intended for the hold or hand baggage. The tag 10 can be incorporated within, or otherwise associated with or attached to conventional luggage labels applied to baggage, including hand luggage, during check-in. Luggage information can therefore also be stored in the central data storage device 12 thereby allowing luggage also to be associated with a particular passenger or group of passengers; if for example, when a family checks-in with luggage common to all of them. The data relating to the luggage can be associated with the family rather than an individual member of the family. If the luggage and passenger or associated passenger are detected in different locations, then the data storage device 12 could be set to generate a security alert. Additionally if either one, or both, of the passenger or associated luggage is not detected at all, then the data storage device 12 could be set to generate a security alert. If desired the data storage device 12 could also detect via tags 10 and antennas 13 if the person currently carrying luggage is not the person originally associated with the luggage. This can be achieved by comparing tag data from the ticket or boarding card, with that from the luggage tag. Where RF tags 10 are attached to luggage, a closed circuit arrangement can be used which is opened if the tag is removed from the luggage. The open circuit can be detected using antennas 13 and an alert can be raised by the data storage device 12. As the data storage device 12 will know the passenger or group of passengers to whom the hand luggage was originally associated, the monitoring of hand luggage will if desired, enable rapid and remote identification of unattended hand luggage. This would for example, be useful in dealing with unattended

automatically, the expected patterns of behaviour of airport user movements in an expected behaviour model. The movement of airport users (all bearing RF tags 10) could be measured to build a model of airport user behaviour. The expected behaviour model can be measured using mathematical parameters for example:

Average time spent in a particular zone

Normal movement sequence point to point within the airport with respect to flight time and gate number for passengers

Average time required to get from current point in the airport to flight gate

Normal movement sequence point to point with respect to work duty behavioural patterns for airport staff

Furthermore the data storage device 12 could constantly compare expected versus actual airport user behaviour as detected by the antennas 13. Any deviations from expected behaviour will be determined by the data storage device 12 and if desired, can generate an alert in appropriate circumstances. Although security alerts could be generated for every deviation from expected behaviour patterns, it may be desired that the alerts are assessed or scored by the data storage device 12 and subject to tolerance filters to minimise false alarms. The data storage device 12 could if desired, be provided with tolerance parameters that can be amended as appropriate for each kind of deviation from expected behaviour.

Furthermore, as the data storage device 12 will know the details of airport users and these details are encoded on an airport user's RF tag 10, the data storage device 12 could discriminate between categories of airport user for example:

Passenger, adult, male

Passenger, adult, female

it would take the average passenger to move from each location in the airport to a boarding gate. The correlation of this information together with the current actual location of passengers and the time of departure could be used by the central data storage device 12 to identify passengers who are likely to be late and alert the airline to take appropriate action.

Furthermore, passenger movements detected by the data storage device 12 via antennas 13, could be correlated with the expected behaviour model in the data storage device 12 to identify passengers whose movements indicate that they may be lost (a security alert could also be generated). This could, if desired be used by airlines to provide assistance and pre-empt any lateness. Airlines could if desired, interrogate the data storage device 12 to locate passengers to a particular airport position or zone. Also, if desired the data storage device 12 could be used at critical times before a flight's departure to help ensure that passengers board an aircraft on time. Interrogation of the data storage device 12 would be possible to identify passengers' locations within the airport after the gate has opened. After a flight is called, passengers known by the data storage device 12 to be in shops or bars within the airport could be monitored to ensure that they start to make their way towards the boarding gate. The data storage device 12 could if desired be set to determine where passengers fail to respond to the boarding call and generate appropriate alerts. Thereafter, measures could be taken to alert specific passengers for example zone specific tannoy announcements. In addition, the data storage device 12 could generate an alert for passengers who have been detected as moving in a direction away from the boarding gate after it has opened for example moving into a bar rather than leaving the bar. Additionally when boarding commences, the data storage device 12 may be used to identify people, particularly minors, who are missing from the boarding area and trace them, via their last detected movements, to specific airport locations. Again, this would be a useful source of information for the airlines. It may be desireable to

CLAIMS

1. A passenger check-in and monitoring system comprising a memory device associated with an item carried by an airport user or staff member, said device containing all appropriate information relating to the airport user or member of staff, a data storage device containing information relating to all airport users and members of staff and a plurality of transmitter devices operable to allow exchange of information between said memory device and said data storage device wherein an expected behavioural model of airport user movement or airport staff movement is stored in the data storage device against which airport user or airport staff behaviour is monitored.

2. A system according to claim 1 in which the behavioural model is updated automatically or manually as desired.

3. A system according to claim 1 or claim 2 wherein the expected behaviour model can be measured using one or more of the following mathematical parameters:

Average time spent in a particular zone;

Normal movement sequence point to point within the airport with respect to flight time and gate number for passengers;

Average time required to get from current point in the airport to flight gate; and

Normal movement sequence point to point with respect to work duty behavioural patterns for airport staff.

4. A system according to any preceding claim wherein any deviations from expected behaviour will be determined by the data storage device and can generate an alert in appropriate circumstances.

5. A system according to claim 4 wherein alerts are assessed or scored by the data storage device and subject to tolerance filters to minimise false alarms.

6. A system according to claim 5 wherein tolerance parameters that are amended as appropriate for each kind of deviation from expected behaviour.

7. A system according to any preceding claim wherein the data storage device can discriminate between at least the following categories of airport user:

Passenger, adult, male;

Passenger, adult, female;

Passenger; child, male;

Passenger, child, female; and

Airport staff, job type.

8. A system according to claim 7 wherein each category of airport user could have their own expected behavioural pattern stored within the central data storage device.

9. A system accordingly to any preceding claim wherein the data storage device is set to track targeted airport users continually.

10. A system according to claim 9 wherein targeted airport users include at least the following:

Airport users known to the authorities;

Airport users in high risk categories; and

Passengers who may require additional help during their transit through the airport.

11. A system according to any preceding claim wherein passenger movements are correlated with the expected behaviour model in the data storage device to identify passengers whose movements indicate that they may be lost.

12. A system according to claim 11 wher in a security alert is also generated.

13. A system according to any preceding claim wherein the memory device comprises an electronic tag.

14. A system according to Claim 13 wherein the electronic tag comprises a radio frequency tag.

15. A system according to any preceding claim wherein the memory device is formed as an integral part of a passenger travel ticket.

16. A system according to any one of Claims 13 to 15 wherein the memory device is formed as an integral part of a passenger boarding card.

17. A system according to any one of Claims 13 to 16 wherein the memory device is formed as an integral part of a airport staff identity badge.

18. A system according to any of the Claims 13 to 17 wherein the memory device is formed as an integral part of a personal identity item carried by an airport user or member of staff.

19. A system according to any preceding Claim wherein data is stored in said memory device in digital form.

20. A system according to any preceding Claim wherein the data storage device comprises a microprocessor based system or computer system upon which data related to all available flights and details of passengers booked to travel on such flights is stored.

21. A system according to any preceding Claim wherein the data storage device comprises a microprocessor based system or computer system upon which data related to all airport staff, their duties and their authorised access to airport locations is stored.

22. A system according to any preceding Claim wherein the data storage device comprises a microprocessor based system or computer

system upon which data related to all airport locations, zones and facilities is stored.

23. A system according to Claim 14 wherein the transmitter devices comprise radio frequency antennas.

24. A system according to any preceding claim wherein the data storage device is linked to an input device in the form of a computer terminal with which data stored in the data storage device can be interrogated or amended.

25. A system according to any preceding claim wherein the data storage device generates a virtual queue for check-in in accordance with each passenger's priority.

26. A system according to any preceding claim in which said transmitter devices and data storage device comprise a neural network.

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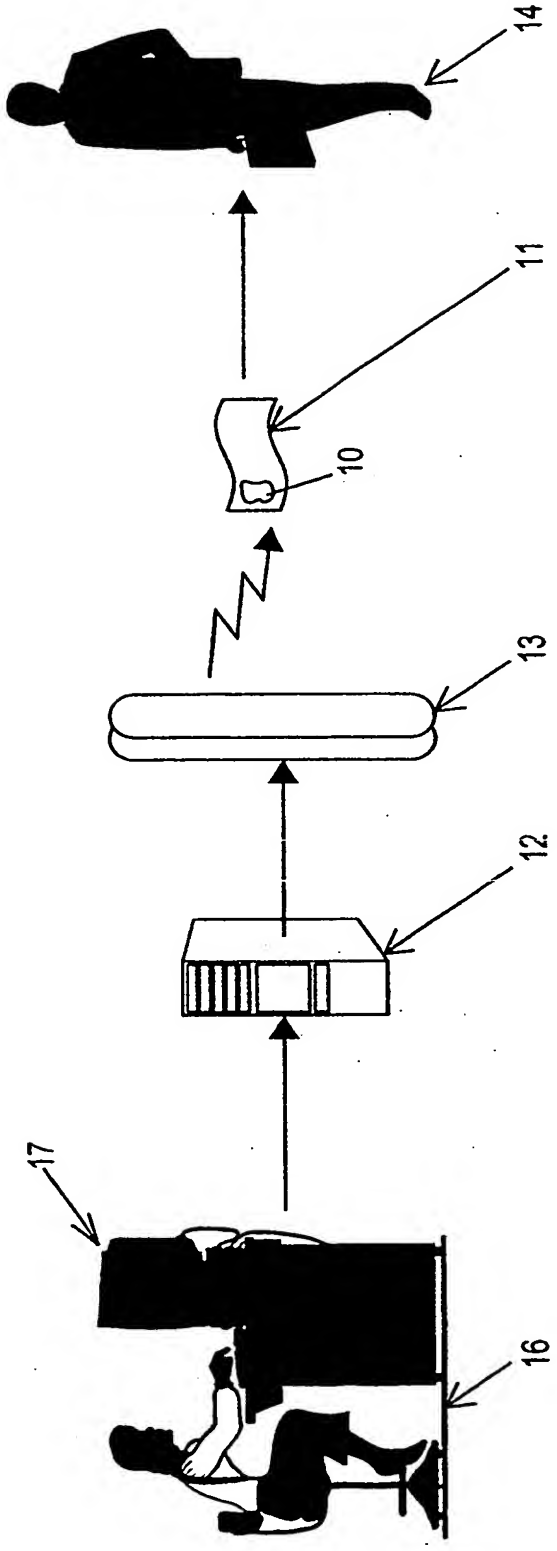

Fig. 1

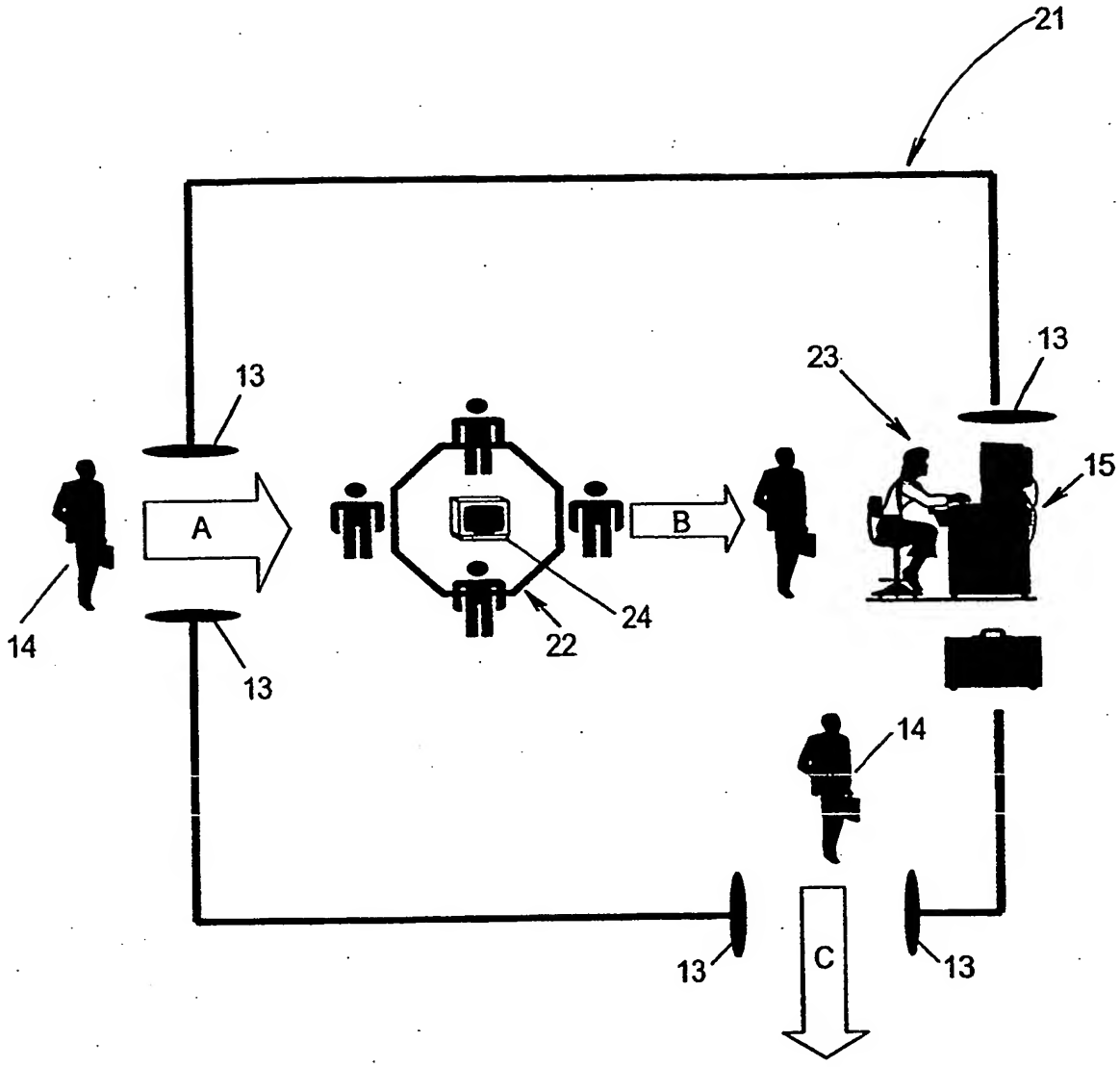

Fig 2

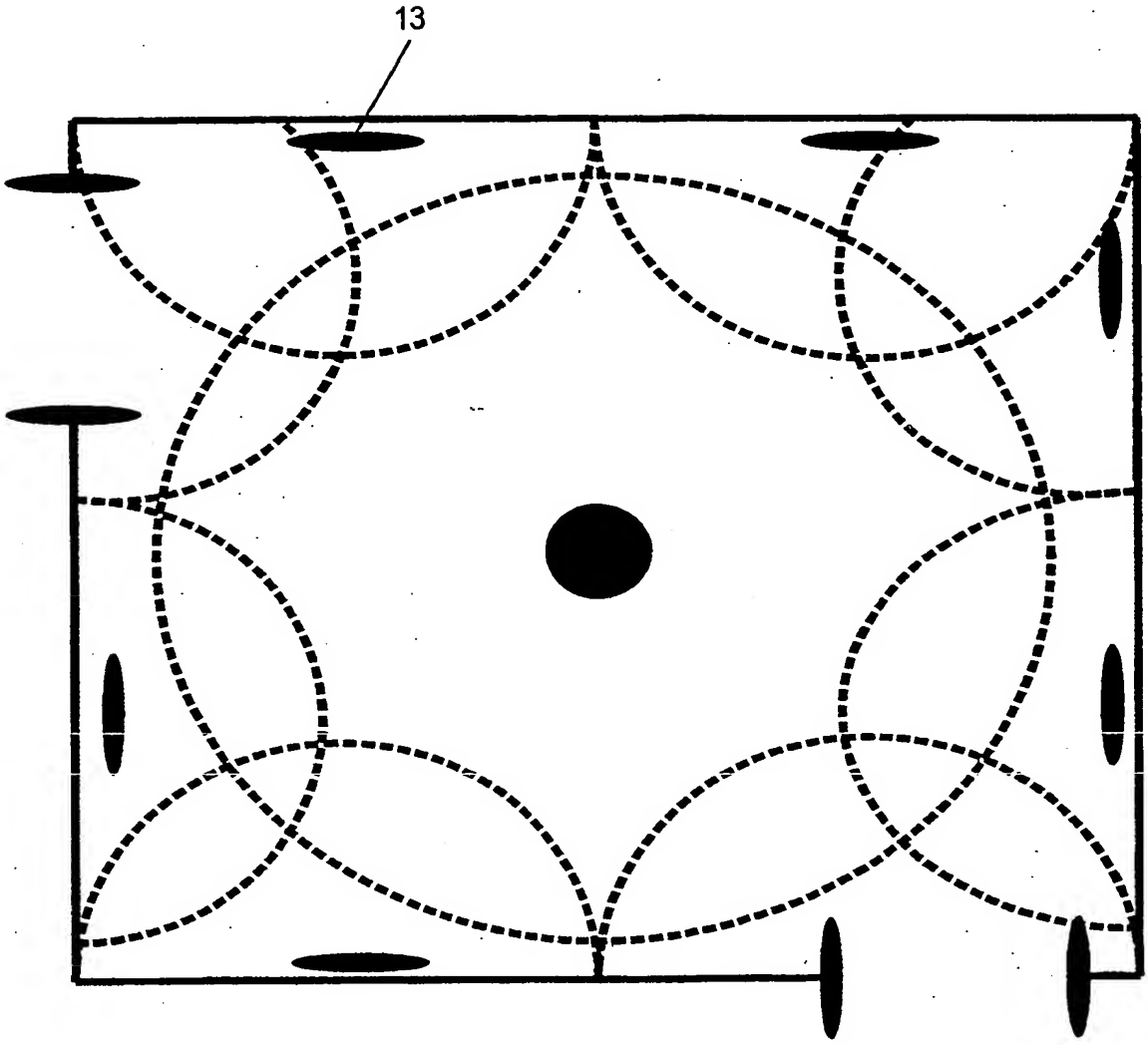

Fig.3